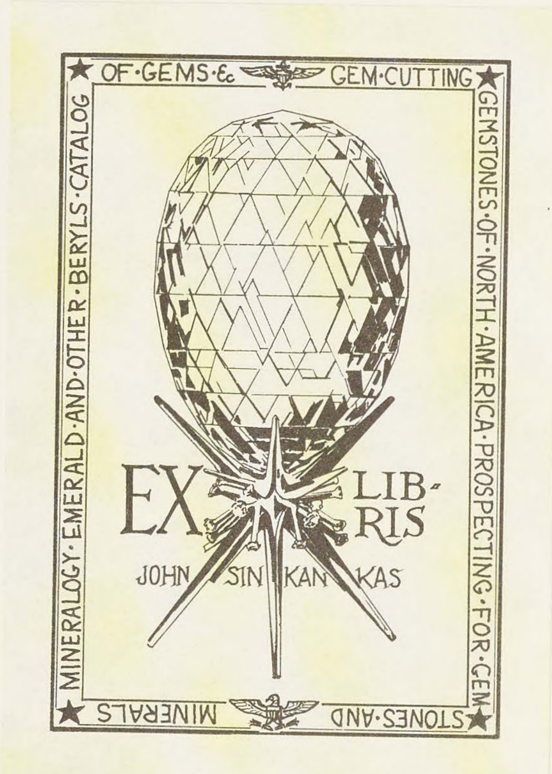
Anderson

ANDERSON, C

Mineralogical Notes No. 11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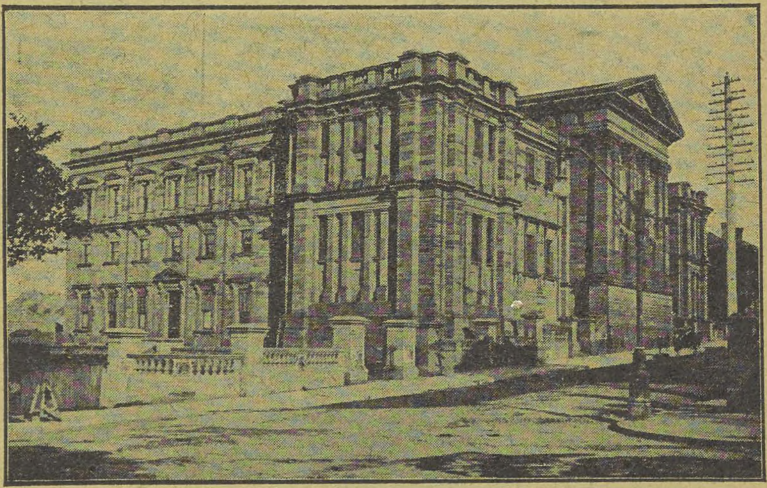

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CHARLES ANDERSON, M.A., D.Sc.,

DIRECTOR.

SYDNEY, MARCH 15TH, 1922

Vale & Pearson Ltd., Printers, 2 Castlereagh Street, Sydney.

9. Pal

MINERALOGICAL NOTES: No. XI.

BY

C. Anderson, M.A., D.Sc., Director.

(Plates xxxviii.-xli.)

DIAMOND.

Near Boggy Camp, Inverell, N.S.Wales.

(Pl. xxxviii., fig. 1, Pl. xxxix., fig. 1.)

An interesting diamond crystal from this field was lent by Mr. D. A. Porter for measurement and description. The diamonds at this locality are found in deposits of sand and gravel, probably of Pliocene age, underlying the basalt capping of a number of isolated hills; they are accompanied by stream tin and a little gold.

The crystal weighs ·0443 grams. It is colourless, and consists of a hexakis-octahedron with indices near (111), twinned on an octahedral face (spinel law), and flattened parallel to the twin plane to form a triangular plate; diamonds of this shape are known at Amsterdam as *naadsteenen* (suture stones). Only six faces of each half of the twin are developed, forming a very low pyramid with curved edges and planes, each face striated in lines running roughly parallel to its intersections with an octahedral face, but towards the periphery the striations curve in conformity with the crystal edges and gradually disappear. A few small triangular depressions appear near the apex, the corners of the pits, as is usual in natural etch pits of the diamond, being directed towards an adjacent octahedral edge.

In order to investigate the "light paths," the crystal was mounted on a two-circle goniometer so that the plane of the triangular plate was approximately parallel to the plane of the vertical circle. Six trails of reflection were found, radiating in pairs from the apex (the centre of Pl. xxxviii., fig. 1), but not reaching quite to the centre. The crystal was adjusted so that the point of intersection of these six paths was approximately polar, and then a large number of readings was taken along each path. The results are plotted in stereographic projection in Pl. xxxix., fig. 1.

Two other diamonds from the same locality in Mr. Porter's collection merit a short description. Both are slightly yellowish; one is a distorted octahedron weighing ·1 gram and built up by a number of parallel and sub-parallel plates; the other, which weighs ·13 grams, is a symmetrical triakis-octahedron with rounded edges.

ANGLESITE.

Dundas, Tasmania.

(Pl. xxxviii., figs. 2, 3, Pl. xxxix., figs. 2-6.)

At the Dundas mines anglesite is a characteristic mineral occurring in well developed crystals, which are sometimes of large size. In a previous paper[1] a crystal from the old Maestries Mine was described and figured, and the occurrence of the mineral has been referred to by the late W. F. Petterd.[2]

A hand specimen was recently presented by Mr. E. Hull. It is not known from what mine the specimen came, but, as it carries crystals of a habit unusual for the Dundas anglesite, some of them were measured and one is figured (Pl. xxxix., figs. 2, 3). The crystals are transparent and glassy, and occur in vughs in a matrix of galena; a few crystals of cerussite are also present. The anglesite is tabular in habit and elongated parallel to the *b* axis, the largest crystals being about ten mm. long; only *m* (110) is present in the prism zone, and no brachy-domes are developed, the largest faces being *c* (001) and *l* (104).

Four exceptionally fine specimens of anglesite from the Comet Mine, Dundas, were recently added to the collection. One of these consists of a mass of beautifully developed, clear, colourless crystals of moderate size, accompanied by limonite. The limonite was formed prior to the anglesite, and is stalactitic, the anglesite being deposited round the stalactites; the limonite when fresh is seen to have a radiated structure, but as a result of decomposition it has been largely converted into a yellow powder or completely removed, leaving a series of parallel tubes penetrating the anglesite.

The crystals were found to be exceptionally rich in faces, a total of fifteen forms, one of which is new, being established. The combinations observed on six crystals are tabulated below.

Cryst.	*c* 001	*a* 100	*b* 010	*m* 110	*n* 120	*k* 130	*o* 011	*d* 102	*l* 104	*z* 111	*τ* 221	*r* 112	*y* 122	* 368	*p* 324
I.	×	×		×	×		×	×		×			×	×	×
II.	×	×		×	×		×	×		×		×	×	×	×
III.	×	×	×	×	×	×		×		×	×	×	×		
IV.	×	×		×	×		×	×	×	×	×	×	×	×	×
V.	×	×		×	×		×	×		×	×	×	×	×	
VI.	×	×	×	×	×		×	×	×	×		×	×	×	×

[1] Anderson—Rec. Austr. Mus., vi., 1905, pp. 90-91, pl. xix., fig. 3.

[2] Petterd—Papers and Procs. Roy. Soc. Tas., 1900-1 (1902), p. 83; Cat. Mins. Tas., pp. 8-9 (Hobart, Govt. Printer, 1901).

The habit of the crystals on this hand specimen are shown in the drawing of Crystal No. IV. (Pl. xxxix., figs. 5, 6), but the individual faces vary considerably in size and shape ; the largest crystals approximate to eight mm. in length along the *b* axis.

Forms and angles :—

Form.	Measured.		Calculated.	
	ϕ	ρ	ϕ	ρ
	° ′	° ′	° ′	° ′
c 001	——	——	——	——
a 100	90 00	90 00	90 00	90 00
b 010	00 02	90 00	00 00	90 00
m 110	51 51	90 00	51 51	90 00
n 120	32 30	90 00	32 29	90 00
k 130	22 51	89 59	23 00	90 00
o 011	00 01	52 12	00 00	52 12
d 102	90 00	39 22	90 00	39 23
l 104	89 57	22 19	90 00	22 19
r 112	51 51	46 12	51 51	46 14
z 111	51 51	64 24	51 51	64 24
τ 221	51 52	76 32	51 51	76 32
y 122	32 29	56 48	32 29	56 48
* 368	32 33	48 43	32 29	48 54
p 324	62 23	54 16	62 22	54 16

The new form (368) was observed eight times. It is a fairly large face, but is generally wavy, and the signals are only moderately good ; the limits obtained for the co-ordinate angles were ϕ 32° 25′ to 32° 46′, ρ 48° 38′ to 48° 47′.

The other three specimens from the Comet Mine are remarkable for the size of the crystals. One consists of a single crystal measuring 11·5 × 4 × 3·5 cm. (Pl. xxxviii., fig. 2). the others are aggregates of crystals, the largest about 3 × 2·5 × 1·75 cm. (Pl. xxxviii., fig. 3).

These also are penetrated by limonite stalactites, mostly powdery, and are elongated parallel to the vertical axis. There are only a few forms present, namely *c* (001), *a* (100), *m* (100), *d* (102), of which the two last are the best developed (Pl. xxxix., fig. 4).

C.S.A. Mine, Cobar, N.S.Wales.

(Pl. xl., figs. 1, 2.)

A specimen lent by Mr. Arthur Combe consists of anglesite in small crystals, the largest about 5 mm. in diameter, accompanied by limonite and small spherules with a pearly lustre which dissolve in hot hydrochloric acid with effervescence, giving a yellow solution containing much iron; these spherules are apparently siderite or ferruginous calcite. Anglesite has not previously been recorded from this lode, the outcrops of which consist of ferruginous and siliceous gossan, with native silver, chloride of silver, azurite, malachite, cerussite, and other minerals, passing downwards into sulphides of iron, copper, lead, and zinc.[3]

The crystals of anglesite are fairly constant in habit, the largest faces belonging to *c* (001), *m* (110), *d* (102), *o* (011).

Forms and angles :—

Form.	Measured.		Calculated.	
	ϕ	ρ	ϕ	ρ
	° ′	° ′	° ′	° ′
c 001	——	——	——	——
a 100	90 05	89 58	90 00	90 00
m 110	51 51	90 14	51 51	90 00
d 102	90 24	39 30	90 00	39 23
l 104	90 27	22 02	90 00	22 19
o 001	00 04	52 18	00 00	52 12
z 111	52 03	64 35	51 51	64 24
y 122	32 39	57 01	32 29	56 48
μ 124	32 31	37 25	32 29	37 23

[3] Andrews—Dept. of Mines N.S.Wales, Min. Resources No. 17, 1911, Pt. I., pp. 163-169.

Mt. Stewart, near Leadville, N.S.Wales.

(Pl. xl., figs. 3, 4.)

On two of the specimens of pyrite (see below) presented by Mr. Combe are some small, transparent, well-formed crystals of anglesite, which occur in nests in the sphalerite, mostly associated with, and in one case intergrown with, quartz. The faces of the measured crystal are smooth and give splendid reflections, with the exception of one, which occurs twice, and is vicinal to the base in the zone (100:001); the values obtained for ρ of this face were 7° 21′ and 6° 41′, average 7° 1′. The crystals are tabular on the base, which is the largest face.

Forms and angles :—

Form.	Measured.		Calculated.	
	ϕ	ρ	ϕ	ρ
	° ′	° ′	° ′	° ′
c 001	——	——	——	——
a 100	89 59	90 00	90 00	90 00
m 110	51 52	90 00	51 51	90 00
o 011	00 01	52 14	00 00	52 12
d 102	90 00	39 23	90 00	39 23
z 111	51 51	64 24	51 51	64 24
y 122	32 28	56 48	32 29	56 48

PYRITE.

Mt. Stewart, near Leadville, N.S.Wales.

(Pl. xxxix., fig. 7.)

Finely crystallised pyrite occurs at this mine. A magnificent example, a block 18 x 14 inches and consisting principally of perfect cubes measuring up to $1\frac{1}{4}$ inches along the edge, has been figured by Mr. G. W. Card.[4] The mineral is argentiferous, and contains about four pounds of bismuth to the ton; it is used in the manufacture of sulphuric acid.

A fine series of the characteristic minerals occurring at Mt. Stewart has been presented to the Museum collection by Mr. A. Combe. One large specimen consists entirely of pyrite, the crystals crowded together

[4] Card—Rec. Geol. Surv. N.S.Wales, III., 1893, p. 125 (figd.); Handbook Min. and Geol. Museum, Sydney, pl. iv. (Sydney, Dept. Mines, 1902).

and comparatively small, the largest measuring about five mm. along the cube edge. The crystals are chiefly cubes modified by narrow faces of the pyritohedron (210) and minute faces of the octahedron (111) and the diploid (213). A few of the crystals are pyritohedral in habit, but are poorly developed. This specimen, like the others mentioned below, was obtained at a depth of about 200 feet (the "intermediate stope"). The remainder of the collection consists of smaller hand specimens, in which the pyrite is accompanied by sphalerite, anglesite, and quartz. Mr. Combe also showed me a specimen of copper sulphate which he had found in a small vugh a little higher up. Pyromorphite in simple hexagonal crystals terminated by the basal plane is also found at this mine.

Forms and angles:—

Form.	Measured.		Calculated.	
	ϕ	ρ	ϕ	ρ
	° ′	° ′	° ′	° ′
a 100	00 01	90 00	00 00	90 00
e { 102	00 01	26 34	00 00	26 34
e { 021	00 00	63 35	00 00	63 26
e { 210	26 36	89 58	26 34	90 00
o 111	45 01	54 54	45 00	54 44
s { 213	26 58	36 28	26 34	36 42
s { 132	18 20	57 50	18 26	57 41
s { 321	34 39	74 52	33 41	74 30

GARNET.

Broken Hill, N.S.Wales.

(Pl. xl., fig. 5.)

At Broken Hill garnet occurs in the garnet-sillimanite-gneiss, in the garnet-sandstone, which is closely associated with the ore deposits, and in the ore itself, where it is accompanied by galena, sphalerite, and rhodonite. It appears that the garnet of the garnet-sandstone and the lode is the manganese variety spessartite, a fact which was, I believe, first pointed out by Mr. D. A. Porter.[5] Professor E. W. Skeats[6] has examined sections

[5] Porter—Journ. Roy. Soc. N. S. Wales, xxviii., 1894 (1895), p. 41; cp. Trans. Austr. Inst. Min. Engineers, xv., Pt. I., 1911, pp. 185-188.

[6] Skeats—Trans. Austr. Inst. Min. Engineers, *loc. cit.*, p. 186.

of the garnet-sandstone, and inclines to the view that the garnet is a secondary mineral formed at the same time as the lode minerals, but just prior to the formation of the metallic minerals.

A fine crystal of spessartite from the Junction North Mine presented to the Museum by Mr. Combe was measured on the goniometer. The crystal, which has a diameter of 13 mm., is of a deep red colour and highly lustrous. It is bounded by faces of the trapezohedron *n* (211), which are developed in almost ideal symmetry. The presence of the forms *d* (111) and *s* (123) is indicated by very narrow planes and striations in the faces of *n* as shown in the figure. A little galena is attached to the garnet.

Forms and angles :—

Form.	Measured.		Calculated.	
	ϕ	ρ	ϕ	ρ
	° ′	° ′	° ′	° ′
d 101	00 04	44 53	00 00	45 00
n 112	45 00	35 15	45 00	35 16
n 121	26 34	65 50	26 34	65 54
s 123	26 43	36 39	26 34	36 42

A very complete analysis by Mr. H. P. White of spessartite from this mine will be found in the Annual Report, Department of Mines N.S.Wales, for 1912 (1913), p. 197.

ANATASE.

Wild Kate Mine, near Deepwater, N.S.Wales.

(Pl. xl., fig. 6.)

This mineral, which is comparatively rare in Australia, has recently been found at the above locality, which is celebrated for its fine wolframite crystals.[7] The crystals, which measure up to 4 mm. along the vertical axis, were found embedded in a clay pocket, and I am indebted to Inspector G. Smith for bringing them under my notice. They are slaty-brown in colour, doubly terminated, and of pyramidal habit, *c* (001), *m* (110), and *p* (111) being the dominant forms. The faces are brilliant but interrupted, and the goniometer signals are frequently multiple. Three crystals were measured with the following results :—

[7] Anderson—Rec. Austr. Mus., v., 1904, p. 303, pl. xli.

Form.	Measured.		Calculated.	
	ϕ	ρ	ϕ	ρ
	° ′	° ′	° ′	° ′
c 001	——	——	——	——
m 110	44 59	89 57	45 00	90 00
e 011	00 01	60 38	00 00	60 38
p 111	44 55	68 13	45 00	68 18
k 112	45 07	51 33	45 00	51 29

Sir Douglas Mawson, in a paper[8] describing anatase from the Glen Osmond Quarry, Adelaide, makes the statement that anatase is there recorded for the first time from Australia. That is not quite correct, for it has previously been recorded, though with very meagre descriptions, from Burrandong and the Cudgegong River, N.S.Wales,[9] from Pakenham[10] and the Woolshed Valley,[11] Victoria, and from Clayton Rivulet and other localities in Tasmania.[12]

SULPHUR.

Hot Lakes District, New Zealand.

(Pl. xli., fig. 1.)

The Museum collection contains a number of specimens of native sulphur, coating siliceous sinter, from the above locality. The sulphur is in minute crystals, the largest not much bigger than a pin's head, but they are well formed, brilliant, and fairly rich in forms. Four crystals were measured and sixteen forms were identified; in addition λ (210) is doubtfully present. The combinations are shown below :—

Cryst.	*c* 001	*a* 100	*b* 010	*m* 110	λ 210	*e* 101	*u* 103	*n* 011	*v* 013	*t* 115	*s* 113	*y* 112	*q* 111	γ 331	*z* 135	*x* 133	*q* 131
I.	×		×				×	×	×	×	×	×	×	×			
II.	×	×	×	×		×		×		×	×	×	×	×			
III.	×		×	×				×		×	×	×	×	×	×	×	×
IV.	×		×	×	?	×		×	×	×	×	×	×	×	×	×	×

8 Mawson—Trans. Roy. Soc. S. Austr., xl., 1916, p. 262.
9 Liversidge—Minerals of N.S.Wales, 1888, p. 84.
10 Newbery—Rept. Prog. Geol. Surv. Vict., 1876 (1877), No. 4, p. 168.
11 Dunn—Bull. Geol. Surv. Vict., 25, 1913, p. 7.
12 Gould—Procs. Roy. Soc. Tas., 1873 (1874), p. 57; Petterd—Cat. Mins. Tas., p. 7 (Hobart, Govt. Printer, 1910).

Forms and angles :—

Form.	Measured.		Calculated.	
	ϕ	ρ	ϕ	ρ
	° ′	° ′	° ′	° ′
c 001	——	——	——	——
a 100	90 05	89 59	90 00	90 00
b 010	00 00	89 58	00 00	90 00
m 110	50 52	90 00	50 51	90 00
λ 210	68 48	88 49	67 51	90 00
e 101	90 03	66 53	90 00	66 52
u 103	90 02	38 01	90 00	37 58
n 011	00 00	62 17	00 00	62 18
v 013	00 01	32 23	00 00	32 25
t 115	50 52	31 06	50 51	31 07
s 113	50 52	45 12	50 51	45 10
y 112	50 51	56 28	50 51	56 28
p 111	50 52	71 39	50 51	71 40
γ 331	50 53	83 41	50 51	83 42
z 135	22 19	50 58	22 16	51 01
x 133	22 18	64 05	22 16	64 06
q 131	22 16	80 49	22 16	80 48

New Hebrides.

(Pl. xli., fig. 2.)

Our collection contains a few specimens of native sulphur from the New Hebrides, where considerable deposits are found round the fumaroles, particularly in the neighbourhood of Yasowa on Tanna, and on Vanua Lava.[13] One specimen, found on Tanna in 1865, consists of crystals thickly deposited on a fine friable matrix resembling volcanic ash. The crystals, which range up to eight mm. in length, are very simple, some showing only the forms *c* (001) and *p* (111), others having faces of *s* (113) and *n* (011) as well. The faces, though interrupted, are smooth and give excellent signals, the measured agreeing well with the calculated angles.

[13] Pelatan—*Fide* Min. Industry, 1894, p. 517; Mawson—Procs. Linn. Soc. N.S.Wales, xxx., 1905, p. 434.

A curious form of sulphur from near Traitor's Head, Erromango, is in the Museum collection. It consists of hollow spherules, measuring up to three mm. in diameter, which have no doubt been formed by gas bubbles when the sulphur was in a molten state. Similar hollow spheres of sulphur have been described by Ōhashi, from the crater lake of the volcano Shirane, Province Kōzuke, Japan.[14] The Erromango spheres are usually perforated by a small circular puncture, with a slightly raised rim, through which the imprisoned gas doubtless escaped. Some have a stalk, or a globular wart, evidently formed by the gas pressure forcing out the wall of the spherical shell at a weak spot. The surface of the spherules has a glazed appearance.

SPHALERITE.

Spring Creek, Bungonia, N.S.Wales.

(Pl. xli., figs. 3, 4.)

Sphalerite is of common occurrence in mineral veins at various Australian localities, but it is seldom found in good crystals. The specimen described here was brought under my notice and subsequently presented to the Museum by Mr. Combe. In our collection there was previously a large hand specimen from this locality, consisting of massive sphalerite, with a few indistinct crystals in association with crystallised quartz, galena, and chalcopyrite. The sphalerite is almost black externally, but on cleavage it shows an amber colour.

The figured crystal is a doublet on the tetrahedral face (spinel law); the two segments interpenetrate and are elongated parallel to the tetrahedral axis, so that the crystal is pseudo-hexagonal in section, the hexagon being formed by the faces of the dodecahedron. The only forms present are the tetrahedron and the dodecahedron, the former predominating. For measurement the crystal was mounted on the goniometer with a tetrahedral face polar. The faces of the tetrahedron are dull and give poor reflections, but the dodecahedron is brilliant.

---

[14] Ōhashi—Journ. Akita Mining College, No. 1, 1919.

Forms and angles:—

Form.	Measured.		Calculated.	
	ϕ	ρ	ϕ	ρ
	° ′	° ′	° ′	° ′
$\underline{d}$ 101 {	29 59	89 59	30 00	90 00
	00 01	35 16	00 00	35 16
o 111	00 08	70 59	00 00	70 32

AZURITE.

Cobar, N.S.Wales.

(Pl. xli., fig. 5.)

In Inspector G. Smith's collection there are a number of specimens of azurite from the Cobar Gladstone Mine, which he kindly placed at my disposal for description. On some of the hand specimens the crystals are large, coarse, and quite unsuitable for measurement, but others carry small crystals, two of which were detached and measured. On account of their softness and crowded condition it was not easy to obtain crystals adapted for the goniometer. The matrix is a mixture of sulphides and oxides of copper and iron.

The crystals are elongated parallel to the *b* axis and tabular on the basal plane, the largest faces belonging to *c* (001), *R* ($\bar{2}$41), *h* (221), and σ (101); on one crystal narrow faces of the unit prism *m* (110) were found. The faces in the zone [100:001] are striated parallel to their intersections, and between *c* and θ ($\bar{1}$01) is a rounded area which gave an almost continuous series of signals which could not be assigned to definite forms. A similar area was found on the azurite of Mineral Hill, Condobolin, N. S. Wales.[15]

For measurement the crystals were mounted with the zone [100:001] equatorial, which would make the *b* pinacoid (not present) the polar plane, and in the table ϕ', ρ', are the co-ordinate angles for this position, the angles ϕ, ρ, for the normal position being placed alongside. The angles are calculated from the elements obtained for the Mineral Hill azurite.[16]

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[15] Anderson—Jour. Roy. Soc. N.S.Wales, li., 1917, pp. 278-279.

[16] Anderson—*Loc. cit.*, pp. 281-284.

Forms and angles:—

Form.	Measured.		Calculated.		Normal.	
	ϕ'	ρ'	ϕ'	ρ'	ϕ	ρ
	° ′	° ′	° ′	° ′	° ′	° ′
c 001	87 35	89 59	87 35	90 00	90 00	02 25
a 100	00 02	90 00	00 00	90 00	90 00	90 00
m 110	00 17	49 24	00 00	49 25	49 25	90 00
l 023	87 35	59 24	87 35	59 27	04 06	30 38
p 021	87 40	29 34	87 35	29 28	01 22	60 34
σ 101	43 02	90 00	42 53	90 00	90 00	47 07
θ $\bar{1}01$	$\overline{45}$ 15	90 00	$\overline{45}$ 14	90 00	$\overline{90}$ 00	44 46
η $\bar{3}02$	$\overline{33}$ 31	90 00	$\overline{33}$ 32	90 00	$\overline{90}$ 00	56 28
h 221	25 41	52 57	25 21	52 50	50 00	70 03
P 223	53 44	64 38	53 48	64 31	51 06	43 14
x $\bar{1}11$	$\overline{45}$ 02	57 48	$\overline{45}$ 12	57 49	$\overline{48}$ 14	53 05
k $\bar{2}21$	$\overline{26}$ 35	52 00	$\overline{26}$ 16	51 54	$\overline{48}$ 50	69 37
R $\bar{2}41$	$\overline{26}$ 27	32 34	$\overline{26}$ 16	32 32	$\overline{29}$ 46	76 14
e $\bar{2}45$	$\overline{69}$ 46	56 25	$\overline{69}$ 38	56 25	$\overline{27}$ 39	38 39
ρ $\bar{1}34$	$\overline{77}$ 50	57 04	$\overline{77}$ 57	57 01	$\overline{18}$ 02	34 56

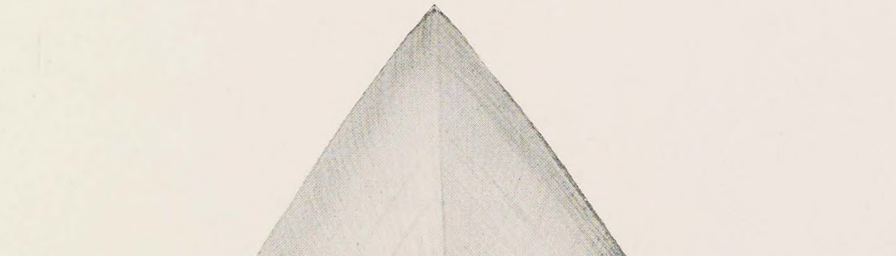
In conclusion I have to record my indebtedness to Messrs. G. Smith, D. A. Porter, and A. Combe (whose transference to the Geological Survey of Uganda is a signal loss to Australian mineralogy), for the loan of specimens, for donations, and much useful information, and to my colleague, Mr. T. H. Smith, for valuable assistance in measuring and drawing the crystals and checking the calculations.

EXPLANATION OF PLATE XXXVIII.

Fig. 1. Diamond, Boggy Camp, Inverell, N. S. Wales; twin on (111), flattened parallel to twin plane.

Fig. 2. Anglesite, Dundas, Tasmania; large broken crystal; about half natural size.

Fig. 3. Anglesite, Dundas, Tasmania; group of crystals; about natural size.



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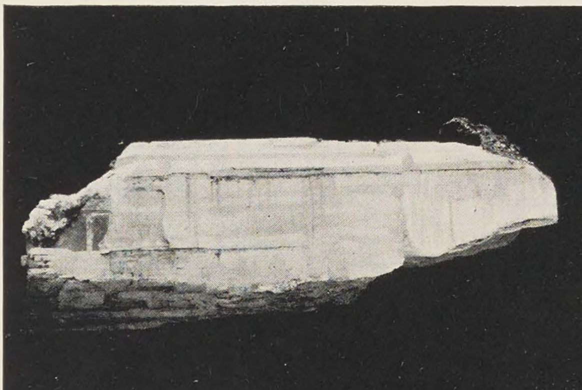
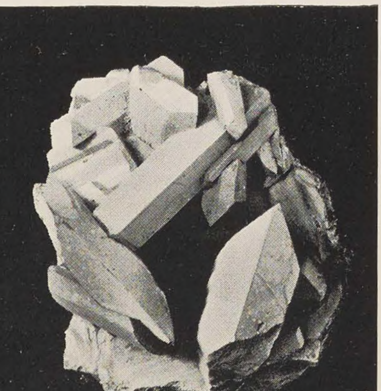




2 3

A. R. McCulloch (1), del.
G. C. Clutton (2-3), photo.

EXPLANATION OF PLATE XXXIX.

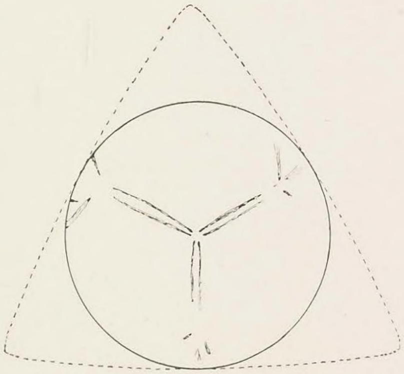
Fig. 1. Diamond, Boggy Camp, Inverell, N. S. Wales; light paths in stereographic projection; dotted outline shows orientation of the crystal.

Figs. 2-6. Anglesite, Dundas, Tasmania.

Forms:—*c* (100), *a* (100), *m* (110), *n* (120), *o* (011), *d* (102), *l* (104), *r* (112), *z* (111), *τ* (221), *y* (122), (368), *p* (324).

Fig. 7. Pyrite, Mt. Stewart, near Leadville, N. S. Wales.

Forms:—*a* (100), *e* (021), *o* (111), *s* (213).



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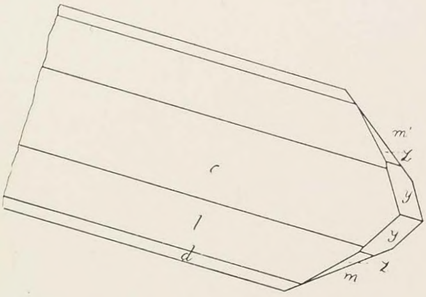

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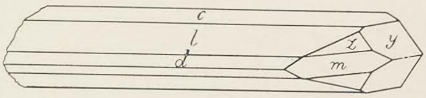

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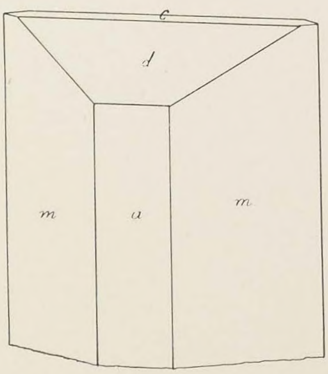

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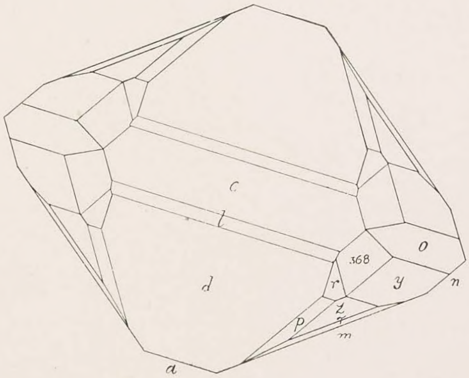

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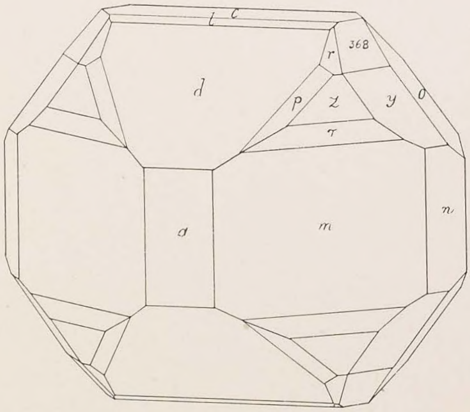

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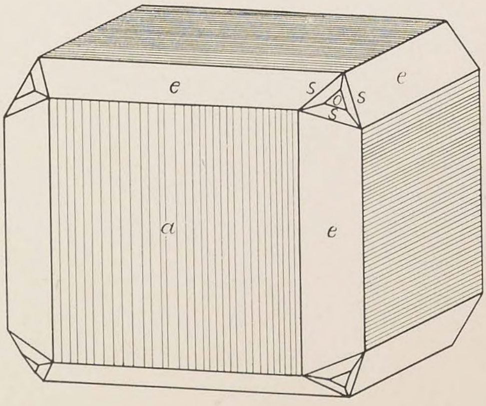

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EXPLANATION OF PLATE XL.

Figs. 1, 2. Anglesite, C.S.A. Mine, Cobar, N. S. Wales.

Figs. 3, 4. Anglesite, Mt. Stewart, near Leadville, N. S. Wales.

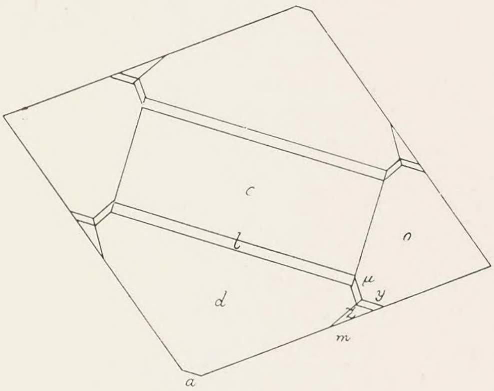
Forms:—*c* (001), *a* (100), *m* (110), *o* (011), *l* (104), *d* (102), *z* (111), *y* (122), μ (124).

Fig. 5. Garnet, Junction North Mine, Broken Hill, N. S. Wales.

Forms:—*d* (101), *n* (112), *s* (123).

Fig. 6. Anatase, Wild Kate Mine, Deepwater, N. S. Wales.

Forms:—*c* (001), *m* (110), *e* (011), *p* (111), *k* (112).



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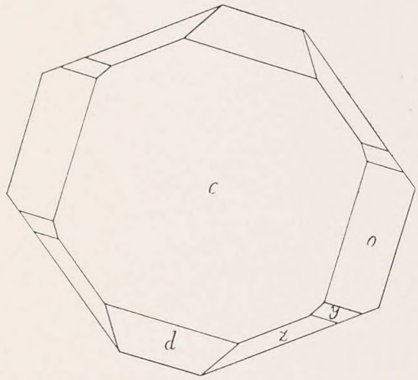

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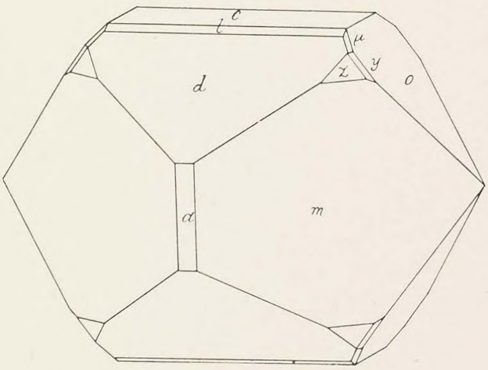

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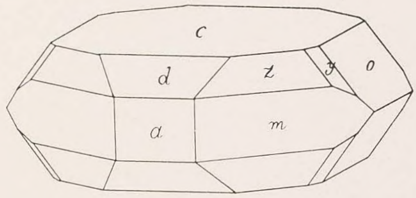

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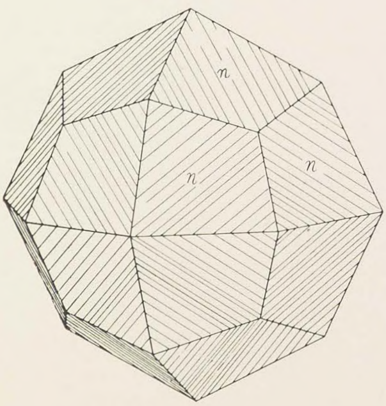

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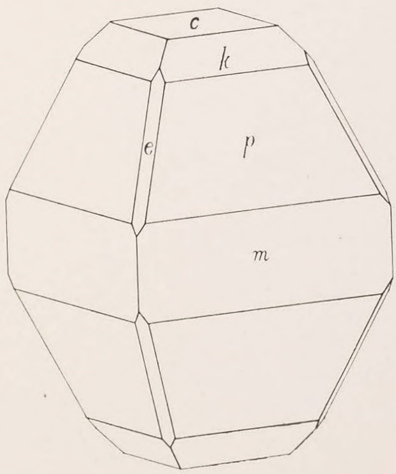

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EXPLANATION OF PLATE XLI.

Fig. 1. Sulphur, Hot Lakes District, N.Zealand.

Fig. 2. Sulphur, Tanna, New Hebrides.

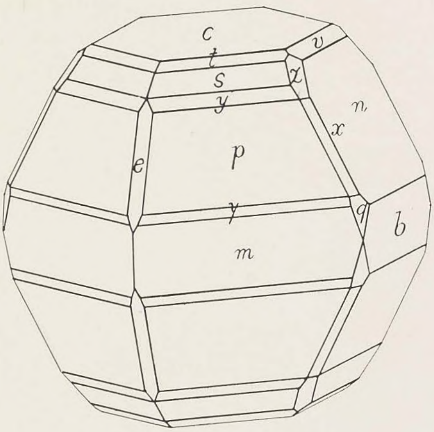
Forms:—c (001), b (010), m (110), e (101), n (011), v (013), t (115), s (113), y (112), p (111), γ (331), z (135), x (133), q (131).

Figs. 3, 4. Sphalerite, Spring Creek, Bungonia, N. S. Wales; a pseudo-hexagonal twin on (111).

Forms:—d (101), o (111).

Fig. 5. Azurite, Cobar Gladstone Mine, Cobar, N. S. Wales.

Forms:—c (001), a (100), m (110), l (023), p (021), σ (101), θ ($\bar{1}01$), η ($\bar{3}02$), h (221), P (223), x ($\bar{1}11$), k ($\bar{2}21$), R ($\bar{2}41$), e ($\bar{2}45$), ρ ($\bar{1}34$).



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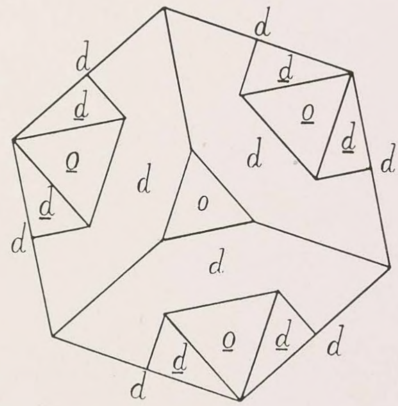

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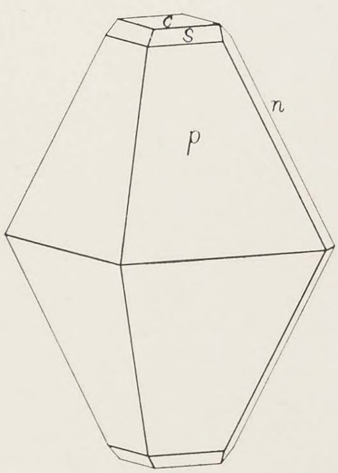

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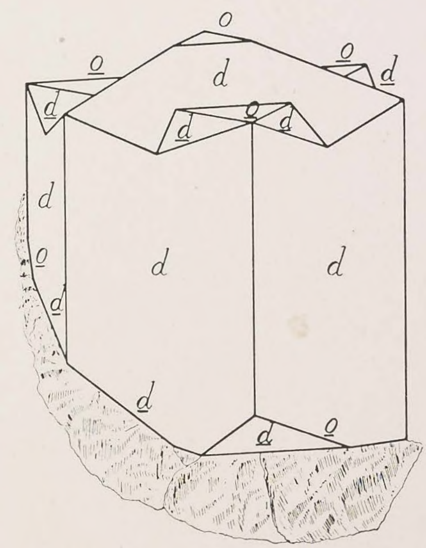

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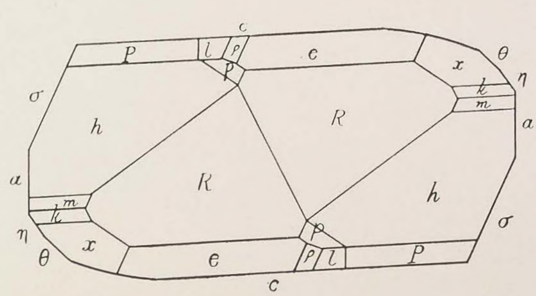

5

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